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ABSTRACT

Correlations indicating the direction and magnitude of relationships between measures of classroom processes and residual scores on the Metropolitan Achievement Test are presented and discussed for second and third grade classrooms. Many of the findings are differentiated according to the socioeconomic status of the pupils and the context of the classroom interaction (whole-class versus small group, public versus private interactions, etc.). Results suggest that the more structured and directive teaching methods are generally associated with higher achievement in the early elementary grades. This study is a part of the Texas Teacher Effectiveness Project; however the same theme is seen as emerging from other major process-product studies of teaching effectiveness. (Author/MV)

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Process-Product Relationships in Second and Third Grade Classrooms

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Running Head: Process-Product Relationships

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Abstract

Correlations indicating the direction and magnitude of relationships between measures of classroom processes and residual scores on the Metropolitan Achievement Test are presented and discussed for second and third grade classrooms. Many of the findings are differentiated according to the SES level of the pupils and the context of the interaction (whole-class versus small group, public versus private interactions, etc.). Results suggest that the more "structured" and "directive" teaching methods are generally associated with higher achievement in the early elementary grades. This same theme is seen as emerging from findings of other major process-product studies of teaching effectiveness.

Process-Product Relationships in Second and Third Grade Classrooms

Introduction

The aim of the Texas Teacher Effectiveness Project has been the exploration of relationships between classroom processes and measures of pupil academic growth. The findings reveal many teacher practices and classroom environment dimensions which predict student achievement, even after beginning-of-year student achievement has been "residualized out" of the criterion data. While the results of the two year study have been discussed in general terms elsewhere (see Brophy & Evertson, 1976), the present report will present and discuss tabular data giving the magnitude and direction of process-product relationships — for lower and higher SES classes separately, and also for the total sample of teachers.

Rosenshine (1970) has noted that correlations between teaching strategies and pupil achievement may be difficult to document because of low stability across time for most teachers' mean classroom achievement scores. The present study avoided this problem by using a "consistency" criterion in selecting teachers. Teachers were chosen on the basis of their consistency in producing student achievement (over a four year period). This means that the product measures, and the resulting process-product correlations,

should be more meaningful and stable than data from one particular group of students at one point in time.

Though some high inference rating were used, most of the process variables in this report resulted from the low inference dyadic interaction observation system (see Brophy & Evertson, Note 1). The system makes many context-specific findings possible, and it allows hypotheses to be generated concerning the exact "optimal" rates of occurrence of many different types of teacher-student interactions. Details of data collection procedures and sample selection are given in the next section.

Other correlational studies similar in design and intent to this study have been conducted by Stallings (1975), Soar (Note 2) and McDonald (1976). While differences in methodology, samples, and instrumentation necessarily are associated with some differences in results, many common findings appear across these major correlational investigations.

Stallings looked at classrooms in seven different Follow Through programs across the country, relating classroom activities recorded with the Stanford Research Institute (SRI) observational instrument to adjusted pupil achievement. Her results showed that relationships with pupil academic growth varied with the grade level of the class (first vs. third), the context of the interaction, and the type of outcome (achievement, non-verbal reasoning, and

student absence rate). Small group instruction was found to be associated with higher achievement in first grade classes, while large group instruction was positively related to achievement gains in the third grade. Also, praise from the teacher was most effective in relatively lower-achieving classes, and verbal criticism was positively related to achievement in certain contexts.

Generally speaking, classrooms characterized by more academic "structure", involving relatively high rates of practice and drill, had higher achievement scores. However, classrooms in Follow Through programs designed to be more "open" (e.g., classes with less direct instruction, where the emphasis is on activities requiring more student initiative and less teacher-controlled lecture and discussion) had higher scores on the Raven's Progressive Matrices test of non-verbal reasoning and a lower student absence rate.

Robert Soar (Note 2) also has studied classroom process and pupil outcomes in Follow Through programs. His findings indicate that a certain degree of teacher direction and control of learning tasks is necessary for maximal student gains to occur. He maintains that the relationship is best characterized by an "inverted U" such that "the extremes of either high or low control [are] associated with smaller amounts of pupil gain" (Soar, Note 2, page 13).

Even more specifically, Soar reports that data from three of his studies support the notion of a "differentiated U" phenomenon, where the learning of lower cognitive level objectives proceeds best under more tightly structured, task-focused learning conditions while more complex and higher level learning proceeds better when students have more freedom to interact with and explore the material to be learned. If one considers performance on the Raven's test to be evidence of learning at a "higher" level than that which is tapped by standardized achievement tests, then this generalization by Soar seems to fit nicely with the Stallings'data on classroom practices associated with gains in achievement vs. processes which may contribute to higher non-verbal reasoning.

Soar also discusses the optimal cognitive level of interaction, noting that, in the elementary grades, for most measures of pupil academic growth, negative relationships exist between the amount of teacher-pupil interaction at a high cognitive level and student achievement. While this negative relationship appeared across all SES levels to some degree, the effect was more pronounced for lower SES pupils, suggesting that too much of this type of activity may be particularly inappropriate for them. As will be discussed later in this report, this finding of Soar's meets with agreement in the results presented here concerning relationships between the difficulty level of the teacher's questioning and student achievement.

Other interactions involving student SES which are reported by Soar show "that positive affect is more functional, and negative affect is more disfunctional, for low SES pupils than for high SES pupils," and " ... plots of the interaction suggest that for high SES pupils, positive affect may be slightly negatively related to gain" (Soar, Note 2, pages 19-20). These findings, too, are supported by data from the Texas Teacher Effectiveness Project.

In a study of second and fifth grade classrooms, McDonald (1976) reports that the pupils' initial scores on achievement tests and the type of instruction received accounted for more of the variance in students' learning than any other predictors; i.e., "teachers do make a difference" (McDonald, 1976, page 12). Further, the data indicated that there were no teaching practices found to be associated with higher pupil achievement in both reading and mathematics at the second and fifth grade levels. This finding fits with results from the other correlational studies in pointing to a need to consider the subject matter, the grade level of the students, and other contextual or curriculum constraints in discussing teaching strategies which are related to higher pupil achievement. The results also provide support for the hypotheses that patterns of teacher behavior, rather than single teaching practices or skills, are important in accounting for teaching effectiveness.

At the second grade level, McDonald reports finding that independent seatwork and small group instruction in reading is effective if it allows for students' access to the teacher, involves students who are not in the group in academically-related reading tasks, and if a variety of materials is used. In teaching mathematics in the second grade, teachers who have students practice operations, correcting the students' work when necessary, tend to have classes with higher achievement scores. Using a variety of materials in second grade mathematics instruction was not effective, presumably because the varying of materials insures a less orderly sequence of problems (from simple to complex) than is desirable. Teaching reading at the fifth grade level was more effective if it entailed discussions, explanations from the teacher, and sustained questioning and answering. Fifth grade mathematics instruction which emphasized both small group and whole-class arrangements was associated with pupil growth, and, since the operations being learned at this level build upon earlier, more basic operations, less direct instruction is required.

In general, the findings from the McDonald study of second and fifth grade classes agree with the other major correlational findings at the elementary level: (1) techniques which provide for more "structured" learning under the control of the teacher are

likely to be related to higher pupil achievement, (2) specific practices will vary in effectiveness according to the context of the interaction and the grade level of the student, and (3) the kind of instruction which the student receives <u>does</u> substantially influence their learning--over and above the influence of their achievement level and socioeconomic status.

The remainder of this paper will describe the sample and data collection procedures and then present the correlations (for both years of the study) between measures of classroom processes and mean residualized student achievement gains on the Metropolitan Achievement Test. All low inference variables were coded for major context distinctions such as morning versus afternoon and whole-class versus small group (reading group) activities. The public versus private nature of the interaction, teacher versus pupil initiation of the interaction, and academic interactions versus procedure-related interactions were also noted.

Findings are presented separately for lower and higher SES classrooms, as well as for the total sample. This makes possible discussions of the effectiveness of many teaching practices with reference to the type of student in the classroom. As will be shown, even a general proxy variable like school SES can moderate the relationship between many measures of teacher-student interaction

and achievement gains. Some variables which are positively correlated with the criteria for higher SES classes are not related to learning gains, or are negatively correlated for lower SES classes — and vice versa.

Method

Subjects. The teachers who were asked, and agreed, to participate in this study were selected from a larger group of 165 urban second and third grade teachers, using a "consistency" criterion. Teachers in the study all had consistent patterns of residualized achievement scores over the four years before the study began. Their average classroom achievement scores over the four years either were all at approximately the same level, or were linearly increasing or decreasing over the same period. These teachers were consistent in their relative gains across five different subtests of the Metropolitan Achievement Test, and across both sexes of students.

Using these consistency criteria, 31 teachers were recruited in the first year, and 28 in the second. They spanned the full range of effectiveness — approximating a normal distribution of residualized achievement scores. That is, as suggested by Soar (1972), the sample was not restricted to including teachers only at the high or low effectiveness extremes.

Of the 31 teachers who were in the first year of the study, 12 were not available the second year. So nine more teachers were added to the second year sample, using the same criteria for selection, to give a second year N of 28. Other details concerning sample selection and characteristics of teachers in the study have been presented in Veldman and Brophy (1974) and Brophy (1973).

There were also at least two other ways that the sample differed from a random sample of teachers in the school district. Because of the requirement that the teachers have stable classroom achievement gains over a four year period, they had to have been teaching for a minimum of four years, and, hence, they averaged more years of teaching experience than a random sample of teachers. Also, factor analyses of responses to a questionnaire administered to the teachers at the end of the second year indicated that they had higher scores on a "traditionalism" factor (Sherman, Brophy, Evertson, and Crawford, 1976) than a randomly selected group of teachers teaching in the same grades in the same school district.

Further analyses indicated that the higher scores on the traditionalism factor were not directly connected with years of experience. Therefore, there is some connection between "traditional" attitudes towards schooling and stability in relative achievement gains by students. Note that the teachers in the stable sample

spanned the full range of effectiveness with regard to achievement scores, so there is not a relationship between the traditionalism factor and the achievement level of pupils.

A moderating variable which interacted with process-product correlational patterns was the SES level of the pupils enrolled in the schools. In both years of the study, the sample ranged from lower SES to upper middle SES. In the first year of the study, a Title I vs. non-Title I distinction was used in arriving at "lower" and "higher" SES groups. In the second year, rankings of SES level were made by school administrators -- the schools were ranked and then split at the median into low and high SES groups. Actually, what will be referred to as low SES and high SES include lower SES up to lower-middle SES and middle-middle to upper-middle SES, respectively.

Instruments

The Brophy and Evertson (Note 1) coding manual gives operational definitions for all of the low inference, teacher-student interaction variables. Data from this coding system for both years of the study constitute the primary measures of classroom process which were related to student academic growth. Each interaction between the teacher and an individual student was recorded. The data indicated whether the teacher or the student initiated the

interaction and whether academic or procedure-related matters were being discussed, while also providing other information concerning the quality of the interaction (for example, the type of feedback provided by the teacher to the student). Raw frequencies were converted to proportion scores to control for unequal numbers of occurences and were then correlated with learning gain measures. Data for 38 process measures are presented in this paper. Brophy and Evertson (Note 3) report correlations for all 171 dyadic interaction variables (and for numerous high inference measures of classroom process).

Information also was obtained with ratings and checklists. One of these instruments, the Classroom Observational Scale (Emmer and Peck, 1973) was used on each visit. The other high inference measures were used on three occasions: early, middle, and late in the year. For each of these measures, data were averaged across the whole year and across coders, to give the most representative estimate of the nature of the classroom during the data collection period. The findings for low inference variables are presented for the three major contexts: morning, whole-class; afternoon, whole-class; and small group (reading group) interactions. The high inference variables were not coded separately for these different contexts. These data indicate how teachers generally or typically conduct their classes.

The criteria for this study were classroom scores on the Metropolitan Achievement Test (MAT) subscales. Gain scores were residualized to control for students' entering levels, and then averaged for each class. Mean residualized gain scores represented the difference between the classrooms' predicted posttest scores and their observed posttest scores. These data approximated a normal distribution. That is, even though all teachers were notably consistent in producing achievement gains over the previous four year period, there was variance in the degree to which achievement gains were more or less than what one would expect based on the students' pretest scores alone. The N's for the criterion data vary somewhat for the different subtests, because a few of the schools in the sample did not administer the arithmetic reasoning subtest.

Procedure

After practice with videotapes and written dialogues and discussions about operational definitions and coding conventions, observers visited classrooms in pairs and continued practicing until they achieved a reliability level of 80% agreement. Coders had to agree not only on the number of interactions coded but also on the manner in which they were coded.

Two different observers coded each classroom (on different occasions). During the first year, there were four observations

made in each teacher's classroom. The duration of each observation was about two and one half hours, making a total of approximately 10 hours of observation time in each of the 31 classrooms in the first year. In the second year, there were 14 observations, yielding approximately 35 hours of classroom observation for each of 28 classrooms. Codes were summed and averaged across observers.

Metropolitan Achievement Test (MAT) scores were available from the school district. These were used in deriving the effectiveness criteria (the residualized mean classroom achievement gains). Teachers' reported attitudes and beliefs were assessed by an extensive questionnaire and a free response interview. Since the focus of this paper is on classroom process correlates of student achievement, these measures will not be presented here. Interested readers are referred to two earlier technical reports: Evertson and Brophy (Note 4) and Brophy and Evertson (Note 5).

One final note: we did not expect a great deal of consistency between findings of the first year of the study and the results from the second year, for two reasons -- 1) The student populations changed from one year to the next, so there is little reason to expect stability in variables which are "student-controlled," and 2) The school district in which the study was conducted mandated several curriculum and methods changes in the summer between the first and second year of data collection. Many of these changes

may be characterized as reflecting more "open" and "flexible" approaches to education (learning centers, team teaching, less time spent in structured activities, etc.). These considerations, and the fact that the first year data were based on only 10 hours in each classroom, suggest that variables which do show consistent process-product relationships across both years of the study reflect strong and stable relationships between classroom processes and student achievement.

Results

Data Analyses. Pearson product-moment correlations were computed between all of the classroom process measures and the five subscales of the MAT. Since the process variables numbered in the hundreds, it was not possible to present and discuss all of these relationships in this report. Therefore, the most meaningful and interpretable relationsips are presented here. Technical reports from the study give the data for all of the variables which were measured (see Brophy and Evertson, Note 5). Findings are presented separately for both years of data collection and, in the case of low inference variables, separately according to the context of the data collection (either morning whole-class, afternoon whole-class, or reading group data). Data are presented separately for the total sample as well as for lower SES classrooms only and higher SES classrooms only.

Non-linear relationships will not be presented here due to space limitations. Briefly, many "inverted U" relationships were found, and these relationships were generally in agreement with the Soar data. As Soar has argued, too much of a particular teacher behavior may be as ineffective in producing student achievement gains as too little of the same behavior. The data from this study also support Soar's notion of differentiated curvilinear relationships between classroom activity and pupil growth. The relationships apparently change according to the context of the activity and the desired outcome.

Many of the low inference variables were coded infrequently. This has important implications for prescriptions to teachers. One would not tell a teacher to "perform this behavior as much as possible" if the positive correlation referred to a variable that occurred only 10 percent of the time (as a mean).

Correlations with Achievement

The correlations have been divided into three broad categories. The first group presented in Table 1, all have to do with the teachers' selection of students for response opportunities and the occurrence of student correct answers, incorrect answers, and other measures of the difficulty level of the teachers' questioning. The first three low inference variables and the high inference rating of non-patterned turn usage in Table 1 are all indices of the various

methods which teachers may use in calling on students to answer questions. The next four low inference variables in Table 1 are measures of the correctness and quality of the students' responses. Data are also presented for two variables which represent high inference ratings of the degree of difficulty of the students' assignments.

Insert Table 1 about here

The first variable is a measure of the percentage of the time the teacher selects a student (out loud) to answer the question before asking that question. Most of the significant correlations with achievement gains are positive. Some negative correlations occurred in the first year, but these were mostly confined to the reading group data for the total sample and for high SES classrooms. The generally positive relationships with achievement for this variable indicate that if the teacher maintains control over which student receives the response opportunity, a more equitable distributions of response opportunities can be expected. This more equitable distribution of potential learning experiences evidently results in higher classroom achievement. The negative correlations for the first year data (reading group context) may be spurious (due to the low number of observations), or, they may indicate that

the use of this technique in small groups is not effective. Other data suggest that activities in reading groups are best if they are fast-paced or "drill-like" in character. This is probably not occurring if the teacher is carefully selecting students to answer each question prior to asking it.

The next variable is a measure of the percentage of time the teacher calls on volunteers during discussions. Findings for this variable were mixed, and only reached statistical significance in the first year data. The general pattern suggests negative correlations for lower SES classrooms and positive correlations for higher SES classrooms. The problem of distributing questions equally among the students is more important for lower SES classrooms (where calling on student volunteers was associated with lower achievement gains). In higher SES classrooms, calling on student volunteers is not apparently detrimental.

The next variable, student "call-outs", showed the expected negative relationships with achievement gains. Presumably, this variable represents disruption in the discussion. The two significant positive correlations which did occur were both for lower SES classrooms. This supports other findings which will be discussed in connection with other variables, indicating that any type of academic student response may be positively correlated with achievement

gains in lower SES classrooms. Call-outs may be disruptive, but they are better than having students sitting and not responding at all.

The rating of the use of non-patterned turns (presented near the end of Table 1) showed several strong negative correlations with the criteria. This further supports the idea that teachers need to maintain control over which students respond, and thereby insure that these opportunities are equally spread among students. If teachers primarily call on students who volunteer, or if they allow too many call outs, many students who could most benefit from the activity will not be involved in it.

The next set of variables in Table 1 refer to the quality of students' answers. Correlations for the percentage of student responses which were correct indicate positive relationships for lower SES classes and negative relationships for the higher SES classes. Two correlations which are significantly negative for lower SES classes (in the first year data) must be considered anomalous in the face of other findings for this variable. Apparently, in lower SES classes the teachers who asked questions which could be answered at the higher success rates were those who also tended to have higher student achievement scores. However, higher SES classrooms characterized by students answering questions at a rate of 75% correct (or less)--mean of 82% minus standard deviation of six percent--were those with higher achievement scores.

The general picture seems to be that it is better for teachers in lower SES classes to teach in small "steps", asking questions which can almost always be answered correctly. The more effective higher SES teachers were more demanding, asking more challenging questions which were answered incorrectly about one fourth of the time or more.

The findings for the next variable (percent incorrect) mirror the results for the "percent correct" variable. That is, in higher SES classes, the teachers who asked questions which were answered incorrectly a larger percentage of the time (more than one fourth) were those with higher achievement scores. In lower SES classes, many negative correlations were found for the "percent incorrect" variable. This indicates that those teachers of lower SES students who asked questions that were answered incorrectly a high percentage of the time tended to have classrooms with lower average achievement scores.

The correlations for "percent of the time the pupil responds that he or she doesn't know" showed few significant relationships, but the ones which were significant were in the positive direction. This suggests that teachers who asked some questions difficult enough to cause students to respond that they "don't know" were those teachers whose classrooms had higher achievement scores.

The means for this process variable were quite low (less than five percent of all student responses were coded as "I don't know") so, this finding actually reflects the difference between teachers who caused students to respond that they "don't know" a small percentage of the time versus never at all.

The next variable, "the percentage of times when the students did not respond at all", shows that there were generally negative relationships between this measure and residualized achievement gains. That is, particularly in lower SES classrooms, teachers who allowed students to remain silent when asked a question were those with lower classroom achievement scores. There is somewhat of a contradiction to this generalization in the first year data -- which show a few positive correlations. However, these findings must be questioned when compared with the second year results because of the low number of observations on which the first year data are based. It makes sense that the teachers of lower SES students (who may be typically less inclined to respond than higher SES students) who did not allow their students to remain silent when they were asked a question were those who had the higher achievement scores.

The last variables presented in Table 1 are high inference measures which support the findings from the low inference indices of questioning difficulty. The first one, a rating of assignments

as being too short or easy for the students, shows the higher SES group with generally negative relationships, while the lower SES group has either non-significantly negative relationships or, for two subtests in the first year data, substantial positive correlations. In the second year data, there were also several significant negative correlations for the total sample. Apparently, if assignments must be either too short and easy or too difficult, it may be better for them to be more difficult in higher SES classrooms.

Conversely, the findings for the rating of assignments as being too hard (where students cannot get started or continually need help), show significant negative correlations for lower SES classrooms. This agrees with the low inference data for correct and incorrect responses, suggesting that lower SES students did better with easier assignments and questions.

The next group of variables all refer to teacher feedback concerning student verbal responses or written work. The first set of variables in Table 2 are measures of teacher praise and criticism in various contexts. The remaining variables are all academic feedback variables, some of which sustain teacher-student interaction, and others of which terminate it. All low inference feedback variables were tallied separately according to the type of student

response they followed (correct, incorrect, "I don't know", or no response). There were marked differences between the process-product relationships for lower and higher SES classrooms for most of these feedback variables.

Insert Table 2 about here

Some of these correlational findings contradict the idea that teachers should praise at each opportunity and should never criticize. The first two variables in Table 2 illustrate this. "Praise after correct answer" and "criticism after wrong answer" both show few significant relationships. In fact, the one significant correlation for praise is -.77; the rest are slight positive or non-significant negative correlations. The second year data for criticism after incorrect answers shows several significantly positive correlations for higher SES classrooms. This indicates that the more effective teachers in higher SES classrooms motivated students to perform up to their capabilities by communicating higher expectations, using a somewhat demanding criticalness.

It should be noted that both praise and criticism were relatively infrequent. The positive correlations for criticism after a wrong answer (for high SES classrooms) should not be considered a basis for advising teachers to criticize their students after wrong answers as much as possible. The means for this variable in different

contexts were all around 5% or less. Therefore, the positive correlation reflects differences between more effective teachers who used criticism sparingly and less effective teachers who never criticized.

Praise given during student initiated private work contacts was negatively correlated, especially in higher SES classes. The next variable, "private, student initiated work contacts involving verbal criticism from the teacher", shows a contrasting pattern for lower and higher SES classrooms. The higher SES group shows generally strong positive correlations, and the lower SES classrooms have generally negative correlations.

These data suggest that effective teachers in higher SES classes tended to use criticism (even if only a small percentage of the time), while minimizing the use of praise (probably by making it contingent on truly outstanding work). In contrast, the more successful teachers in lower SES classrooms occasionally praised and generally avoided criticism during student initiated work contacts.

One measure of verbal praise which did correlate positively with student achievement was "percentage of opinion questions which were followed by praise". In the second year reading group data for lower SES classrooms, there are two strong positive correlations indicating that teachers who gave relatively more praise following student responses to opinion questions tended to have classrooms

with higher achievement. This seems to be another aspect of effective teaching in lower SES classrooms--supporting and encouraging the student, generally being more "student oriented." It may be that by praising lower SES students' responses to opinion questions, these teachers were effectively increasing their participation in class discussions.

The proportion of academic praise and criticism (together) which was coded as praise continues this pattern. Praise is relatively more effective in lower SES classrooms, while lower proportions of praise, or higher proportions of criticism, were associated with higher achievement gains in high SES classrooms.

Ratings of the teacher's use of symbols such as stars and smiling faces (usually put with the pupil's name on a bulletin board) suggest that these reinforcements may be productive in increasing pupil achievement at the early grades, even though praise is not. The second year data for this variable show several positive correlations for both lower and higher SES classrooms.

The last process variable relating to teacher praise is a rating of the teacher's use of monitor and helper jobs as rewards. The second year data showed consistently strong negative correlations. Most likely, the assignment of jobs such as monitoring or cleaning erasers was <u>not</u> perceived by the students at this grade level as being a positive reinforcement or reward.

The remaining variables in Table 2 all refer to different types of academic feedback following pupil responses to questions. Process feedback (a detailed, "why" explanation from the teacher) was positively correlated with achievement for both low and high SES classrooms. Asking a new question to the same student showed inconsistent relationships. Calling on another student after an incorrect response was correlated negatively for lower SES classrooms, but positively for higher SES classrooms. The negative relationships for lower SES classes may be another aspect of the idea that these students needed to have response opportunities distributed equally among them by the teacher.

Simple repetition of the question is correlated negatively for both low and high SES classrooms, while rephrasing or giving clues is correlated positively for lower SES classes and negatively correlated for the high SES group. The variable "teacher asks a new question following student incorrect answer" shows mixed findings.

The last five low inference variables in Table 2 refer to teacher feedback when students say that they don't know or do not respond at all. "Calling on another student when the first student says that he doesn't know" correlated positively for higher SES classes but negatively for lower SES classes. For the variable representing all types of sustaining feedback, we find that the teachers in higher SES classes who repeated questions, rephrased,

or asked new questions were those who tended to have lower mean achievement gains (data for year 1 for these two variables are not presented because this type of feedback did not occur enough during four observations to allow meaningful correlations to be computed). Asking another student the question when the first student does not respond was positively correlated in several instances for higher SES classes (in the second year data), but was negatively correlated for lower SES classrooms. These relationships apparently reflect the need for teachers in lower SES classrooms to stick with the student at least enough to get some type of response, even if that response is not the correct answer.

Allowing other students to call out answers when the first student does not respond shows the expected negative relationships. Presumably, if a large number of student "call outs" to questions occur, the discussion will be disrupted, and the student who was asked the question will have lost an opportunity to respond. The last low inference variable in Table 2 reflects the occurrence of any kind of sustaining feedback following a student not responding to the teacher's question. As with the parallel variable for feedback following "don't know," this variable shows mostly negative correlations for higher SES classrooms but some positive relationships for the lower SES group.

The trend which emerges from these feedback variables is that the kinds of feedback classified as "sustaining" are usually correlated positively with achievement for lower SES classes, but negatively for higher SES classes. The "terminal feedback" variables show an opposite pattern. These findings indicate that effective teachers in lower SES classes concentrate on getting their students involved in classroom activities and worked at eliciting responses from them (while encouraging good effort with appropriate use of verbal praise), while effective higher SES teachers frequently terminated interactions with the original respondent and called on other students.

The third major type of instructional practice addressed by these data is behavior management. The process variables observed were the frequency of behavioral praise, behavioral warnings and criticisms, and "disciplinary errors." Following Kounin's (1970) description, errors included target errors (calling on the wrong student during a misbehavior), timing errors (allowing the misbehavior to continue too long), and overreactions. Also, several ratings were made of the types of classroom rules and teacher actions taken with respect to student behavior problems. Table 3 gives the correlations.

Insert Table 3 about here

The first variable in Table 3 is behavioral praise. Generally low correlations are found except for the afternoon, whole-class context, where there were several negative correlations for the lower SES group. This may mean that behavioral praise is ineffective with lower SES students, or that the students are causing the high rates of behavioral praise; that is, teachers may praise the behavior of students in lower achieving classes more than in higher achieving classrooms because the lower achieving students may not often have academic work which warrants praise.

Except for two correlations for the reading context, the variable representing the ratio of behavioral warnings to behavioral warnings and criticisms shows positive correlations. Behavioral warnings were more effective in producing task oriented, smoothly operating classrooms than harsher criticism. Once again, however, it may be that the teacher behavior is not causing the student behavior: higher achieving students could present less severe problems to the teachers, thus requiring fewer criticisms.

The next four variables refer to teacher disciplinary errors which might be made in the process of correcting students' misbehaviors. The variable "percentage of disciplinary contacts involving one or more error" showed mostly negative correlations, although two correlations (both for lower SES) were positive. These positive correlations may indicate that some teachers were over-zealous,

highly active monitors who made some errors in the process of holding student misbehaviors to a minimum. However, teachers who commit fewer errors generally will have better behaved classrooms.

The next three process variables are all measures of the ratio of each individual type of error to the total number of teacher errors. The variable representing "target" errors divided by the total number of disciplinary errors did not show any significant relationships with learning gains. This is probably primarily due to the infrequent occurrence of this type of error.

However, there is a contrast between the relationships with achievement for timing errors divided by total errors and overreactions divided by total errors. Several strong negative correlations were found for the ratio of timing errors, to total numbers of disciplinary errors while the correlations were usually positive when the relationship was significant for overreactions divided by total errors. These results suggest that, of the three types of errors studied, timing errors are particularly ill suited to smooth classroom management, and that teacher "overreactions" may be less detrimental.

Concerning the ratings of the teacher's use of different systems of rules, it was found that teachers who had rules requiring that students had to always get permission to leave their seats tended to have lower classroom achievement scores. As a corollary

to this finding, it was also discovered that teachers in higher SES classrooms who allowed students to go to specific places without permission were those with the higher classroom achievement gains. However, the data for lower SES classrooms suggest that this may not be an effective way of governing a lower SES classroom.

The last variable, a rating of the degree to which the teacher underreacted to control problems, supports the findings for the low inference variable concerning teacher overreactions. That is, particularly in lower SES classrooms, teachers who were rated as underreacting were those whose classrooms were less well behaved and had lower achievement scores.

In general, these findings for behavior management strategies are strong indicators of the important relationship that classroom behavior problems have with student achievement level. They support Kounin's (1970) description of effective teachers as "withit." These teachers are capable of conducting smoothly operating classroom activities, they make few disciplinary errors, and they avoid timing errors (not allowing student misbehaviors to increase in severity or to spread to other students). These teachers were thus the ones whose pupils tended to spend more time on academic tasks, and hence were found to have higher achievement scores.

In this section, we have presented correlations for some of the more influential process variables. Interested readers are referred to other technical reports for information concerning means of low inference variables (broken down by SES level, student sex, and grade level) and for inter-coder reliability information on high inference variables (as previously stated, the low inference instrument was being used at an 80% or higher level of agreement prior to data collection). The final report, Brophy and Evertson (Note 3), gives the reliabilities for high inference ratings; the Brophy, Evertson, Crawford, and Sherman (Note 6) report gives the means for the low inference process variables.

Discussion

The data suggest many hypotheses about effective teaching (for the promotion of academic growth) in the early elementary grades. However, two important caveats must be considered:

1. The data are correlational and do not allow causal statements. One experiment employing a treatment partly based on these correlational findings has reported significant differences favoring the classes of the trained teachers on posttest achievement data (Anderson and Brophy, Note 7). Another large scale teacher training experiment is underway at Stanford University (under the direction of N.L. Gage) which should shed further light on these

correlational findings and those of Stallings (1975), McDonald (1976), and Soar (Note 2). As results from experiments accumulate in support of hypotheses suggested by these correlational studies, we may become more confident in making statements about teacher behaviors causing higher pupil achievement.

2. The only criterion of "effective teaching" on which these process-product correlations are based is classroom achievement level. Although the data are far from clear-cut, there is some evidence (primarily Stallings, 1975) that the classroom process predictors of affective outcomes differ from the variables which predict student achievement. One recent study (Wright, 1975) has suggested that more structured or direct ways of teaching not only result in higher pupil achievement, but also in lower levels of reported anxiety. In any case, one should keep in mind that discussions of "effective teaching" in the present report refer to success in enhancing achievement, and not necessarily in producing better attitudes, higher self-esteem, less anxiety, etc.

A general pattern of findings which is emerging in the results of process-product correlational studies (in the early elementary grades is that teachers who maintain task-oriented classes by maximizing academic interactions and avoiding behavior problems tend to be those whose classes show the greatest gains in achievement.

At least in the early grades, it seems that children need more "direct instruction in order to master the basic verbal and mathematical skills. This generalization fits with developmental theory, as well--children in the second and third grades will have only recently attained concrete operations; since their cognitive structures are not yet fully developed with respect to academic skills, they require "structure" or "order" to be imposed by the teacher for maximal academic growth to occur. As children become more mature and are concentrating on applying instead of acquiring basic skills, it may be more useful to allow more pupil initiation, along with less teacher direction--perhaps by making more extensive use of discovery approaches to learning or "open" education practices.

The present results which are differentiated by SES level suggest that the need to use direct instructional practices may even be more important in teaching lower SES second and third graders. SES is a proxy variable, standing in part for achievement motivation level, school related anxiety, a history of success or failure in school activities, and, to some degree, achievement level. If one considers that the lower SES student may be less interested in the subject matter and more fearful of responding in the first place, then most of the different findings for different SES levels make sense. The most successful teachers in low SES classes were those who asked easier question, occasionally praised but rarely criticized,

and sustained interaction by rephrasing, providing clues, or asking new questions. All of these methods may be seen as encouraging and maintaining a high level of involvement in learning.

The task in higher SES classes may more often be to maintain an already fairly high level of interest in the subject matter by motivating the students to perform through a somewhat challenging and perhaps even "critical" manner of teaching. Effective teachers in higher SES classes were observed asking more difficult questions and giving critical comments concerning answers or work (when needed). Also possibly by capitalizing on the sense of academic competition existing in higher SES classes, successful teachers often redirected a question to another pupil when the first answered incorrectly. The basic idea seems to be the communication of higher expectations--letting the student know they are expected to perform up to their capabilities.

Though there was no single process variable measuring it (and hence, no one specific correlation to point to), the data presented which pertain to behavior management suggest that Kounin's concept of "withitness" is a valid approach to the minimization of behavior problems in the classroom. The teacher who is "withit" avoids the necessity of being reactive by preventing most problems in the first place (e.g. through a system of rules which the children understand).

and when problems do arise, he or she deals with them accurately and swiftly, keeping disciplinary errors to a minimum. "Withit" teachers are aware of what's going on in their classes, and they actively communicate this awareness to the pupils.

The data presented here (and in reports of other large-scale process-product studies) show that what goes on in classrooms does make a difference in pupil outcomes. The findings constitute a rebuttal to those who would say that nothing is known about the behavioral correlates of teaching effectivenes, or that, since initial ability and SES account for such high percentages of posttest variance, classroom activities make little or no difference in pupil achievement. The fact that many results vary with the context of the data and/or with the type of pupil illustrates the need for conceptualizing effective teaching as a complex process involving consideration of numerous factors, rather than the implementation of generalized competencies supposedly appropriate with all students at all times. We are seeing the accumulation of a relatively cohesive data base allowing specific recommendations or hypotheses concerning the kinds of teaching likely to promote academic growth in the primary grades.

Reference Notes

1. Brophy, J. & Evertson, C. The Texas teacher effectiveness study: Classroom coding manual (Res. Rep. 76-2). Austin, Texas: Research and Development Center for Teacher Education, 1973.

2. Soar, R.S. An integration of findings from four studies of teacher effectiveness. San Diego, Cal.: Invitational Conferences on Research on Effective Teaching (co-sponsored by NIE and the California Commission on Teacher Preparation and Licensing), August, 1975.

3. Brophy, J. & Evertson, C. Process-product correlations in the Texas teacher effectiveness study: Final report (Res. Rep. 74-4). Austin, Texas: Research and Development Center for Teacher Education, 1974.

4. Evertson, C., Brophy, J., & Crawford, J. The Texas teacher effectiveness project: An investigation of selected presage-process relationships (Res. Rep. 75-16). Austin, Texas: Research and Development Center for Teacher Education, 1975.

5. Brophy, J. & Evertson, C. The Texas teacher effectiveness project: Presentation of non-linear relationships and summary discussion (Res. Rep. 74-6). Austin, Texas: Research and Development Center for Teacher Education, 1974.

6. Brophy, J., Evertson, C., Crawford, J., & Sherman, G. The Texas teacher effectiveness study: Student sex, grade, and socio-

economic status differences in classroom process measures (Res. Rep. 75-21). Austin, Texas: Research and Development Center for Teacher Education, 1975.

7. Anderson, L. & Brophy, J. An experimental investigation of first grade reading group instruction (Res. Rep. 76-3). Austin, Texas: Research and Development Center for Teacher Education, 1976.

References

Brophy, J. Stability of teacher effectiveness. American Educational Research Journal, 1973, 10, 245-252.

Brophy, J. & Evertson, C. Learning from teaching: A developmental perspective. Boston: Allyn and Bacon, 1976.

Emmer, E. & Peck, R. Dimensions of classroom behavior. Journal of Educational Psychology, 1973, 64, 223-240.

Kounin, J. Discipline and group management in classrooms. New York: Holt, Rinehart and Winston, 1970.

McDonald, J.J. Beginning teacher evaluation study, Phase II, 1973-74: Summary report. Princton, N.J.: Educational Testing Service, 1976.

Rosenshine, B. The stability of teacher effects upon student achievement. Review of Educational Research, 1970, 40, 647-662.

Sherman, G., Brophy, J., Evertson, C., & Crawford, J. Traditional attitudes and teacher consistency in producing student learning gains in the early elementary grades. Journal of School Psychology, 1976, 14, 192-201.

Soar, R. Teacher behavior related to pupil growth. International Review of Education, 1972, 18, 508-526.

Stallings, J. Implementation and child effects of teaching practices in Follow Through classrooms. Monographs of the Society for Research in Child Development. 1975, 40, (7-8, Serial No. 163).

Veldman, D. & Brophy, J. Measuring teacher effects on pupil achievement. Journal of Educational Psychology, 1974, 66, 319-324.

Wright, R.J. The affective and cognitive consequences of an open education elementary school. American Educational Research Journal, Fall, 1975, 12 (4), 449-468.

Table 1

Process-Product Correlations (Yr. 1 & Yr. 2) for Measures of Teacher Questioning and Student Responding *

Process Variables		Whole Class Interaction, Mornings					Whole Class Interaction, Afternoons					Reading Groups				
		WK	WD	R	AC	AR	WK	WD	R	AC	AR	WK	WD	R	AC	AR
Percentage of All Response Opportunities in Which the Teacher Selects the Respondent Before Asking the Question	Yr. 1	-19	-10	05	-01	-20	-30	-23	-11	-17	-29	-47	-23	-43	-30	-43
		-13 -26	-04 -17	13 -00	45 -35	45 -34	-07 -40	-22 -34	19 -25	-07 -22	04 -32	11 -63	-06 -34	04 -61	45 -61	68 -54
	Yr. 2	07	-03	15	10	29	56	36	55	14	35	50	19	50	24	42
		-31 20	-52 13	09 14	07 13	33 34	31 71	-20 66	43 59	-23 33	-05 43	46 60	-05 36	22 54	-14 54	-05 62
Percentage of All Response Opportunities in Which the Teacher Calls on a Volunteer	Yr. 1	22	30	16	13	48	-02	04	-04	-06	10	25	34	26	-04	03
		-27 39	-15 50	-62 44	-55 58	-28 56	-22 03	-05 -05	-32 03	-37 35	-27 24	-36 48	04 44	-35 50	-56 34	-93 17
	Yr. 2	-11	-22	-11	-14	-24	-24	-22	-13	-07	-33	-20	-02	-27	-24	-24
		-16 -04	-03 -33	02 -18	-06 -19	-30 -24	-32 -17	-19 -22	-02 -21	23 -29	-04 -36	-32 -11	04 -04	-47 -23	-30 -21	-35 -18
Percentage of All Response Opportunities in Which a Student Calls out the Answer	Yr. 1	-26	-36	-20	-09	-22	10	-15	-07	-03	-02	-17	-28	-05	03	-02
		-04 -30	-13 -42	55 -39	23 -23	-03 -24	-10 -07	-15 -07	01 -04	-08 02	05 -03	-14 -16	-45 -12	34 -15	28 -17	20 -08
	Yr. 2	-21	08	-32	-11	-20	-20	-02	-24	-14	-08	-25	-05	-26	04	-13
		-12 -53	25 -21	-21 -50	09 -48	03 -43	08 -25	-07 01	04 -29	05 -18	-40 -03	-11 -41	07 -17	34 -42	51 -36	24 -31
Percentage of All Public, Teacher-asked Questions Which are Answered Correctly	Yr. 1	-27	-21	-33	-28	-27	-01	09	-02	00	08	-05	07	04	04	-08
		-56 -31	-60 -13	-40 -60	-14 -53	34 -44	-03 -05	-02 09	-10 -06	11 -13	86 -10	29 -40	02 -08	35-39	40 -31	90 -39
	Yr. 2	-07	-07	03	11	-25	-19	-04	-23	-03	-12	-30	-12	-13	05	-23
		69 -41	58 -41	51 -31	48 -04	16 -30	30 -52	27 -25	-06 -40	06 -09	-01 -13	-25 -34	-14 -05	-30-28	14 -11	-10 -26
Percentage of All Public, Teacher-asked Questions Which are Answered Incorrectly	Yr. 1	15	11	08	05	14	01	01	12	23	11	-02	-01	-09	-19	06
		32 15	43 -09	03 24	-25 43	-35 31	-10 09	-17 17	12 15	16 33	-35 27	-33 44	-04 27	-29 31	-60 36	-82 46
	Yr. 2	19	02	07	05	35	23	00	40	22	37	27	09	01	-18	15
		-44 49	-50 21	-17 39	-38 33	-12 47	-40 77	-43 36	14 64	06 39	08 50	33 19	30 -15	14 09	-39 18	-27 37

Table 1, Con't.

Process Variables		Whole Class Interaction, Mornings					Whole Class Interaction, Afternoons					Reading Groups				
		WK	WD	R	AC	AR	WK	WD	R	AC		WK	WD	R	AC	AR
Percentage of All Response Opportunities in Which Student Responds "I Don't Know"	Yr. 1	24 14 27	18 15 18	45 55 42	07 -07 15	15 -37 25	14 -- 34	09 -- 21	27 -- 42	24 -- 04	11 -- 15	09 14 06	06 10 02	10 -19 18	06 11 05	03 -19 09
	Yr. 2	00 -20 29	00 -15 23	-01 -03 10	24 27 30	19 16 26	-21 -36 -22	-17 -43 -02	-04 48 -30	06 32 -22	05 36 -18	-10 -40 64	03 -15 41	09 09 45	28 40 06	25 44 14
Percentage of All Response Opportunities in Which Student Makes No Response	Yr. 1	08 47 10	12 44 20	02 41 12	16 68 -21	-09 75 -22	-05 19 -19	-05 23 -16	-14 02 -20	-17 -24 -12	-21 -74 -24	09 29 08	-08 19 -17	-04 02 07	18 25 13	06 -20 12
	Yr. 2	-08 -64 31	07 -57 64	00 -63 41	-08 -39 20	27 -04 40	-08 -18 -20	-03 01 -23	-20 -31 -14	-31 -49 -26	-25 -35 -50	10 10 07	-12 -15 -17	04 04 20	-04 01 -05	05 31 -14

	Year 1										Year 2									
	Word Knowledge		Word Discrimination		Reading		Arith. Computation		Arith. Reasoning		Word Knowledge		Word Discrimination		Reading		Arith. Compuration		Arith. Reasoning	
	Total		Total		Total		Total		Total		Total		Total		Total		Total		Total	
	T1	NT	T1	NT	T1	NT	T1	NT	T1	NT	L	H	L	H	L	H	L	H	L	H
+ Ratings of the Use of Non-patterned Turns	-47		-15		-57*		-64		-70		-56 -72	-43	-26 -12	-38	-20 -33	-21	07 -04	17	-05 -09	-02
+ Ratings of Assignments Being Too Short or Too Easy for the Students	-23 -36	-16	-16 -23	-02	-06 18	-11	-03 27	-35	-09 54	-31	-32 -19	-49	-20 -44	-16	-40 08	-53	-41 -34	-51	-23 -19	-35
+ Ratings of Assignments Being Too Hard; Students Can't Get Started or Continually Need Help	-11 03	-13	-15 -03	-07	-21 -06	-19	00 02	00	-02 -71	10	-01 -33	--	4 -18 -18	--	-17 -57	--	04 -38	--	25 -32	--

Table 1, Con't.

♠ Correlations in each triad represent the relationships for the total sample of teachers in the top center, the lower SES group of classes in the lower left, and the higher SES group of classes in the lower right. Coefficients underlined once have associated p values between .05 and .10; those underlined twice have probabilities less than .05. Where correlations are not presented, there were insufficient data (i.e., the behavior did not occur enough for frequencies to be computed).

✦ High inference ratings.

Table 2

Teacher Reactions to Student Responses *

Process Variables		Whole Class Interaction, Mornings					Whole Class Interaction, Afternoons					Reading Groups				
		WK	WD	R	AC	AR	WK	WD	R	AC	AR	WK	WD	R	AC	AR
Percentage of All Correct Answers Followed by Praise	Yr. 1	23	-01	25	03	22	-07	-09	12	-05	-11	-04	-06	-19	-02	-12
		-05 28	-24 04	-16 35	-18 12	02 24	-24 -01	-35 02	03 16	-02 -07	-77 -03	36 -21	07 -16	06 -34	11 -09	24 -19
	Yr. 2	11	-10	20	05	17	18	04	25	21	27	-07	-16	15	13	17
		01 18	-11 -08	-02 23	-16 14	-17 25	-01 27	11 03	-03 31	25 21	12 28	-22 -03	20 -23	10 12	42 06	47 17
Percentage of All Incorrect Answers Followed by Criticism	Yr. 1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --
	Yr. 2	-02	-09	24	14	34	13	09	12	-08	-02	-14	-04	02	03	16
		-- --	-- --	-- --	-- --	-- --	-24 --	-25 --	20 --	-19 --	-46 --	-45 59	-26 37	-15 61	-04 49	-07 66
Percentage of All Student Initiated Private Work Contacts Involving Praise	Yr. 1	-17	-25	-13	01	-19	-14	-06	-03	24	05	-24	-04	-07	-27	-39
		-57 -09	-62 -15	-49 -05	-16 07	-26 -20	15 -30	20 -24	25 -18	40 12	53 -03	-- --	-- --	-- --	-- --	-- --
	Yr. 2	-44	-30	-49	-57	-71	00	04	-07	00	-10	02	-09	-06	-04	-03
		27 -75	-03 -43	-02 -67	-15 -80	-66 -71	10 -20	15 -15	02 -08	08 -10	-26 -12	-10 08	-04 -11	-03 -08	10 -17	39 -15
Percentage of All Student Initiated Private Work Contacts Involving Criticism	Yr. 1	12	04	22	19	27	09	01	13	16	18	--	--	--	--	--
		13 13	11 04	22 25	-11 33	-23 36	30 04	05 10	36 12	30 04	69 15	-- --	-- --	-- --	-- --	-- --
	Yr. 2	35	11	45	08	27	17	-13	18	13	25	17	10	42	08	40
		-21 58	-41 32	09 52	-31 25	-20 40	-31 39	-52 06	28 15	-22 30	-03 32	-84 59	-71 39	-30 59	-34 33	-24 54

Table 2, con't.

Process Variables		Whole Class Interaction, Mornings					Whole Class Interaction, Afternoons					Reading Groups				
		WK	WD	R	AC	AR	WK	WD	R	AC	AR	WK	WD	R	AC	AR
Percentage of All Opinion Questions Followed by Praise	Yr. 1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --
	Yr. 2	--	--	--	--	--	-20	-13	-12	-17	00	20	02	-06	-05	-07
		-- --	-- --	-- --	-- --	-- --	30 -13	17 -06	21 -13	-25 -01	-37 16	70 --	23 --	60 --	07 --	-20 --
Percentage of All Teacher Praise and Criticism Which is Praise	Yr. 1	23	-02	21	31	34	-04	03	-11	07	-04	23	14	20	22	16
		-58 46	-53 23	-35 38	-18 55	04 38	-16 -03	18 -09	-21 -15	-15 20	-43 -01	54 18	26 -13	24 09	33 25	78 21
	Yr. 2	-06	05	-11	05	-08	04	18	-15	05	-09	-15	-17	-24	02	-21
		15 -13	30 -08	-16 -16	08 06	-20 01	52 -26	61 -12	-11 -25	20 -07	05 -08	45 -60	40 -54	-08 -37	07 -05	-04 -27
Percentage of All Correct Answers Followed by No Teacher Feedback	Yr. 1	-06	-19	-02	12	13	-17	-17	02	18	09	-05	-09	18	06	30
		-08 -05	-25 -16	07 -04	-07 24	-75 20	-- -14	-- -10	-- 09	-- 18	-- 12	-- 11	-- -05	-- 35	-- 26	-- 35
	Yr. 2	23	09	-11	-01	00	20	01	13	-05	-08	30	06	04	-10	06
		40 13	44 -17	10 -20	-21 14	-26 05	-- -05	-- -14	-- -04	-- 02	-- -16	57 --	19 --	36 --	-20 --	-27 --
Percentage of All Correct Answers Followed by Process Feedback	Yr. 1	03	-15	02	-07	19	31	15	24	13	37	17	-06	22	21	27
		-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	27 --	-14 --	04 --	17 --	42 --
	Yr. 2	35	28	45	18	32	31	22	44	34	37	08	22	27	33	34
		-44 63	-24 48	-31 56	05 26	-02 42	-- 54	-- 24	-- 49	-- 25	-- 37	-25 80	07 61	21 63	41 16	43 44

Table 2, con't.

Process Variables		Whole Class Interaction, Mornings					Whole Class Interaction, Afternoons					Reading Groups				
		WK	WD	R	AC	AR	WK	WD	R	AC	AR	WK	WD	R	AC	AR
Percentage of All Incorrect Answers Followed by the Teacher Calling On Another Student	Yr. 1	11	22	02	-02	16	-13	-08	-03	-13	-02	30	41	20	-11	-06
		-20 18	-03 30	-64 20	-31 11	— 26	-25 -17	-31 -12	-16 -11	-36 -04	-- -06	08 37	28 41	-41 39	-37 06	-72 -00
	Yr. 2	16	19	09	-23	-12	-03	09	04	-03	-06	37	22	12	-28	-04
		26 13	13 25	01 12	-55 01	-72 06	-29 15	-02 17	-14 10	03 -07	-13 01	20 50	16 27	-26 26	-43 -16	-19 05
Percentage of All Incorrect Answers Followed by the Teacher Repeating the Question	Yr. 1	-12	-03	-21	-33	-50	-03	-08	-05	-03	-08	-20	-08	-29	-18	-11
		-17 -17	16 -15	-30 -03	-17 -53	-- -53	-15 03	-28 06	-05 -03	05 -09	-- -20	09 -40	22 -23	-02 -47	-02 -38	27 -24
	Yr. 2	14	10	18	14	19	-24	-17	23	27	14	-44	-40	-04	-01	01
		09 20	06 15	-27 32	03 23	06 27	-30 -07	-29 -10	24 24	44 15	68 -02	-61 -26	-40 -48	-15 07	00 00	25 -18
Percentage of All Incorrect Answers Followed by Teacher Rephrasing the Question or Giving a Clue	Yr. 1	30	17	13	20	22	07	03	10	15	06	02	02	01	16	26
		-- 28	-- 12	-- 02	-- 23	-- 23	22 17	17 24	41 13	32 05	-- 13	03 -03	35 -15	65 -19	-04 23	-03 28
	Yr. 2	04	-15	19	29	26	08	-10	-19	04	04	-03	-07	-09	13	04
		-02 05	-19 -16	37 16	42 18	63 15	38 -32	29 -24	02 -28	-06 12	-01 -12	16 -31	14 -38	24 -30	31 -19	05 00
Percentage of All Incorrect Answers Followed by the Teacher Asking a New Question	Yr. 1	-06	01	-09	10	06	-14	-09	-27	-02	-07	07	03	15	16	-09
		13 --	34 --	44 --	30 --	-- --	-- -26	-- 16	-- -31	-- -19	-- -04	01 06	-01 -00	20 09	48 -02	33 -16
	Yr. 2	20	-06	24	26	36	-16	-11	-32	-33	-37	-03	-08	16	18	14
		02 31	-31 10	22 26	02 42	31 34	-- -38	-- -22	-- -59	-- -46	-- -36	-11 --	-04 --	38 --	32 --	37 --

Table 2, con't.

Process Variables		Whole Class Interaction, Mornings					Whole Class Interaction, Afternoons					Reading Groups				
		WK	WD	R	AC	AR	WK	WD	R	AC	AR	WK	WD	R	AC	AR
Percentage of All "I Don't Know" Responses Followed by the Teacher Calling on Another Student	Yr. 1	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —
	Yr. 2	10 — 22	56 — 67	16 — 23	42 — 64	39 — 39	-46 -58 -37	-13 -43 -01	-05 -39 01	04 -33 20	01 -- 00	-08 49 29	16 -37 63	25 -29 56	-06 -49 71	23 -45 63
Percentage of all "I Don't Know" Responses Followed by Some Kind of Sustaining Feedback (The Sum of "Repeats, "Rephrases," and "Asks A New Question")	Yr. 1	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —
	Yr. 2	-04 — -28	-49 — -70	-13 -- -23	-40 — -80	-55 — -71	-09 — —	-09 — —	-25 — —	-29 — —	-46 — —	— — —	— — —	— — —	— — —	— — —
Percentage of Times The Student Makes No Response Followed By the Teacher Calling on Another Student	Yr. 1	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —
	Yr. 2	19 19 14	20 13 19	-09 -07 -05	-19 -12 -29	-11 -57 -04	-09 -38 26	07 -44 61	10 -07 12	-11 -39 12	-10 -62 17	-19 -09 53	10 03 24	10 -75 43	-25 -74 31	-09 -71 27
Percentage of Time the Student Makes No Response Followed By Another Student Calling Out the Answer	Yr. 1	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —	— — — — — — — — — —
	Yr. 2	-44 -10 —	-16 — 00 —	-48 — -17 —	-38 — 07 —	-29 — 24 —	-02 13 —	06 — 10 —	-17 — 08 —	-02 — 26 —	-28 — 43 —	-06 45 -42	01 17 -10	-17 44 -42	-02 23 -27	-05 -14 -02

Table 2, con't.

Process Variables	Whole Class Interaction, Mornings					Whole Class Interaction, Afternoons					Reading Groups				
	WK	WD	R	AC	AR	WK	WD	R	AC	AR	WK	WD	R	AC	AR
Percentage of Times the Student Makes No Response Followed By Some Kind of Sustaining Feedback (The Sum of "Repeats," "Rephrases," or "Asks New Question")	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —
	-10 -23	-19 -01	19 -38	28 -03	35 31	-04 23	-13 -31	-18 43	10 -65	03 -14	-13 -25	-09 -08	02 -08	20 -22	14 68
	14	23	35	60	31	-20	28	-04	53	-16			42	-04	51 -23 -32

Description	Year 1										Year 2									
	Word Knowledge		Word Discrimination		Reading		Arith. Computation		Arith. Reasoning		Word Knowledge		Word Discrimination		Reading		Arith. Computation		Arith. Reasoning	
	Total		Total		Total		Total		Total		Total		Total		Total		Total		Total	
	T1	NT	T1	NT	T1	NT	T1	NT	T1	NT	L	H	L	H	L	H	L	H	L	H
Use of Symbolic Rewards Such as Stars, Smiling Faces, Etc.	00	21 -08	-02	30 -19	-13	10 -24	03	31 -14	-16	27 -21	21	02 38	46	52 46	07	-01 29	26	37 13	25	63 01
Use of Monitor and Helper Jobs as Rewards	07	— 10	08	— 22	14	— 14	00	— 05	09	— 21	-27	-44 -20	-21	-20 -30	-43	-69 -42	-32	-39 -30	-20	-42 -21

Table 2, con't.

* Correlations in each triad represent the relationships for the total sample of teachers in the top center, the lower SES group of classes in the lower left, and the higher SES group of classes in the lower right. Coefficients underlined once have associated p values between .05 and .10; those underlined twice have probabilities less than .05. Where correlations are not presented, there were insufficient data (i.e., the behavior did not occur enough for frequencies to be computed).

+ High inference ratings.

Table 3

Teacher-Student Interactions
Concerning Behavior Management *

Process Variables		Whole Class Interaction, Mornings					Whole Class Interaction, Afternoons					Reading Groups				
		WK	WD	R	AC	AR	WK	WD	R	AC	AR	WK	WD	R	AC	AR
Percentage of All Behavioral Contacts Involving Praise	Yr. 1	10	-04	-13	-04	-02	05	-00	05	-06	05	--	--	--	--	--
		-08 10	-12 -07	-38 -15	-40 02	-69 00	-- 08	-- -01	-- 10	-- 07	-- 09	-- --	-- --	-- --	-- --	-- --
	Yr. 2	-07	-13	13	-04	-06	-19	-34	-08	-18	-13	-20	-16	-02	01	-04
		-09 00	32 -23	-33 18	-24 06	-35 04	-45 -05	-44 -28	-82 02	-57 -04	-65 00	-- -22	-- -20	-- -09	-- -13	-- -06
Percentage of All Behavioral Warnings and Criticisms That Were Warnings	Yr. 1	31	35	09	21	42	06	03	20	25	13	06	05	-20	-08	45
		04 37	35 37	36 04	-19 37	35 43	01 09	-02 07	08 29	36 18	52 10	-- -02	-- -09	-- -17	-- 12	-- 48
	Yr. 2	00	-11	-10	-05	-04	00	31	04	16	-18	-22	-09	-20	-03	-38
		-13 05	15 -23	-30 -05	27 -21	-02 -04	09 -05	59 16	-18 11	49 -03	35 -31	-09 -31	14 -24	-51 -09	-11 06	-39 -40
Percentage of Discipline Contacts Involving One or More Teacher Errors	Yr. 1	-24	-14	-21	-23	-41	-19	-01	-21	-03	13	-20	05	-17	02	-16
		12 -33	11 -23	-09 -25	-03 -32	35 -49	-08 -18	-01 19	-12 -12	-07 04	82 06	-- --	-- --	-- --	-- --	-- --
	Yr. 2	26	05	11	-06	09	-09	-05	-06	-10	02	19	11	-03	-19	-09
		48 07	10 -02	30 04	-31 27	-35 36	34 -19	05 -05	47 -23	-10 -08	-15 09	35 -11	18 -05	24 -22	-11 -42	-19 -07
Percentage of All Disciplinary Errors That were Target Errors	Yr. 1	13	-01	24	18	20	07	10	08	-13	00	--	--	--	--	--
		-- --	-- --	-- --	-- --	-- --	12 --	35 --	41 --	-36 --	-- --	-37 --	-42 --	16 --	-03 --	-- --
	Yr. 2	15	29	27	24	13	19	21	05	-04	-05	--	--	--	--	--
		-25 46	36 24	15 39	47 04	41 03	-- 29	-- 28	-- 08	-- -06	-- -04	-- --	-- --	-- --	-- --	-- --

Table 3, con't.

Process Variables		Whole Class Interaction, Mornings					Whole Class Interaction, Afternoons					Reading Groups				
		WK	WD	R	AC	AR	WK	WD	R	AC	AR	WK	WD	R	AC	AR
Percentage of All Disciplinary Errors That were Timing Errors	Yr. 1	-22	-36	-62	-16	-04	-02	-12	02	-19	-01	--	--	--	--	--
		-18 -23	-53 -23	-89 -49	-49 02	-- -04	-31 --	-64 --	-17 --	20 --	-- --	-- --	-- --	-- --	-- --	-- --
	Yr. 2	03	13	-02	-20	-16	06	22	07	06	04	--	--	--	--	--
		-- 28	-- 51	-- 18	-- -04	-- -02	-- 15	-- 21	-- 12	-- 08	-- 13	-32 --	-14 --	-36 --	40 --	-- --
Percentage of All Disciplinary Errors That were Teacher Overreactions	Yr. 1	39	47	50	38	51	-35	-38	-33	07	-24	--	--	--	--	--
		-- --	-- --	-- --	-- --	-- --	-09 --	06 --	01 --	26 --	-- --	-- --	-- --	-- --	-- --	-- --
	Yr. 2	-10	-26	-16	01	12	-09	-15	01	10	25	39	01	61	48	76
		59 -49	03 -46	41 -35	-08 08	05 13	-- -24	-- -19	-- 00	-- 15	-- 23	-- 69	-- 55	-- 71	-- 92	-- 93

Description	Year 1					Year 2				
	Word Knowledge	Word Discrimination	Reading	Arith. Computation	Arith. Reasoning	Word Knowledge	Word Discrimination	Reading	Arith. Computation	Arith. Reasoning
	Total T1 NT	Total T1 NT	Total T1 NT	Total T1 NT	Total T1 NT	Total L H	Total L H	Total L H	Total L H	Total L H
Ratings of the Extent to Which Students Must Always Get Permission to Leave Seat	06	16	05	09	09	-21	-23	-41	-31	-49
	33 -01	16 29	00 17	00 19	14 12	-- --	-- --	-- --	-- --	-- --